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Editorial

In September 1999, the conference "NP-Hardness and Phase Transitions" was held at the International Center for Theoretical Physics in Trieste, with an attendance composed of mathematicians, computer scientists and physicists. The present volume of Theoretical Computer Science is a follow up of this endeavour, which aims at showing recent progresses and current trends in an active and interdisciplinary field.

Threshold phenomena, well known from the pioneer works of Erdős and Renyi, have attracted over the past few years a lot of attention in the context of random combinatorial problems. Graph coloring, the satisfaction of Boolean formulae, the vertex cover problem, ... are examples of NP-hard combinatorial problems that may exhibit phase transitions when control parameters, defining distributions of random instances, are modified. Though major progresses in the understanding of threshold phenomena have been achieved by mathematicians and computer scientists, research in the field has recently benefited from the contributions of another community, namely physicists.

Phase transitions have been intensively studied in statistical physics for more than a century, and a large bunch of conceptual and technical tools have been developed to deal with them. That such tools can be successfully applied to random combinatorial problems to tackle, and reach some intuition on unclear aspects of threshold phenomena is now established. There is no doubt that random combinatorial problems are true mathematical objects and, as such, should ultimately be treated and understood rigorously. However, it is our belief that physical approaches may propose new and stimulating perspectives on these issues that could eventually benefit to mathematicians and computer scientists.

Besides their intrinsic interest, phase transitions in random combinatorial problems are a lively example of an interdisciplinary field of research, as illustrated by the various contributions contained in the present volume. We hope that readers from either community will enjoy the richness and variety of the current research on random combinatorial problems, and will be convinced that interdisciplinary approaches are not only fascinating but also fructuous.

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